

Application No.: 10/728,135

Docket No.: JCLA12578

**REMARKS****Present Status of the Application**

The Office Action rejected all presently-pending claims 1-13. Specifically, the Office Action rejected claims 1-13 under 35 U.S.C. 103(a), as being unpatentable over Huang (U.S. Patent No. 6,939,664) in view of Yu et al. (U.S. Patent No. 5,282,066). Applicant has amended claim 11 and added claims 14-15 to more explicitly describe the claimed invention.

**Discussion of Office Action Rejections**

The Office Action rejected claims 1-13 under 35 U.S.C. 103(a), as being unpatentable over Huang (U.S. Patent No. 6,939,664) in view of Yu et al. (U.S. Patent No. 5,282,066). Applicants respectfully traverse the rejections for at least the reasons set forth below.

Independent claim 1 recites the features as follows:

1. An immersion lithography process, comprising:  
forming a photoresist layer on a material layer;  
forming a protective layer on the photoresist layer;  
performing an immersion exposure step to define an exposed portion and an unexposed portion in the photoresist layer;  
performing a baking step to alter a polarity of the protective layer on the exposed portion of the photoresist layer by acid produced in the exposed portions of the photoresist layer in the immersion exposure step; and  
performing a development step to remove the exposed portion of the photoresist layer and the protective layer thereon.

(emphasis added).

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Claims 2-6 also recite the similar features.

Independent claim 7 recites the features as follows:

7. An immersion lithography process, comprising:  
forming a photoresist layer on a material layer;  
forming an acid supplying layer on the photoresist layer;  
forming a protective layer on the acid supplying layer;  
performing an immersion exposure step to define an exposed portion and  
an unexposed portion in the photoresist layer, while an acid is produced in the  
acid supplying layer;  
performing a baking step to make the acid produced in the acid  
supplying layer diffuse to the protective layer and the unexposed portion of the  
photoresist layer; and  
performing a development step to pattern the protective layer, the acid  
supplying layer and the photoresist layer simultaneously.

(emphasis added).

Claims 8-10 also recite the similar features.

Independent claim 11 recites the features as follows:

11. A mask layer structure applied in an immersion lithography process,  
comprising:  
a photoresist layer on a material layer; and  
a protective layer on the photoresist layer for preventing mutual diffusion  
between the photoresist layer and an immersion liquid used in an immersion  
exposure step of the immersion lithography process, wherein the protective layer

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is made of an acid-sensitive and radiation unsensitive material and polarity of the protective layer is capable of being altered by acid.

(emphasis added).

Claims 12-15 also recite the similar features.

In the outstanding Office Action, the Examiner admitted that "the difference between the claims and Huang is that Huang does not disclose forming a protective layer on the resist layer and/or the acid supplying layer". Additionally, the Examiner also admitted that "Huang does not disclose that the acid produced in the imaging resist layer is diffused in the protective layer". Applicants assert that Huang merely disclosed the photoresist layer recited in claims 1, 7, 11 and Yu merely disclosed the protective layer recited in claims 1, 7 and 11. Both Huang and Yu fail to disclose that the protective layer on the exposed photoresist layer is made of an acid-sensitive and radiation unsensitive material (claim 1). Additionally, both Huang and Yu fail to disclose that the development step recited in claim 7.

Specifically, from column 9, lines 52-61 and column 10, lines 1-6, Huang merely disclosed that "acid generated by the radiation-sensitive acid generator in exposed regions of the resist layer makes the exposed regions soluble", but Huang does not disclose that the acid generated by the radiation-sensitive acid generator can diffuse into a protective layer on the resist layer. Furthermore, Huang does not disclose that a protective layer formed on the resist layer can be made of an acid-sensitive and radiation unsensitive material and property of a

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protective layer can be altered by the acid generated in the resist layer. In another aspect, Yu merely disclosed a protective layer formed on a photoresist layer, but Applicants consider that property of the protective layer disclosed by Yu can not be altered by acid without teaching or suggestion of the present invention. Even though Huang and Yu are combined, the acid generated by the radiation-sensitive acid generator (disclosed by Huang) would not alter property of any underlying or topcoat layer, i.e. the protective layer disclosed by Yu because both Huang and Yu fail to teach or suggest that the protective layer is made of an acid-sensitive and radiation unsensitive material and polarity of the protective layer is capable of being altered by acid.

In the claimed invention, property of the protective layer is not altered by the immersion exposure step, but property of the protective layer is capable of being altered by acid generated in the photoresist layer during the baking step and being removed by the development step. Applicants assert that even though Huang and Yu are combined, one ordinary skilled in the art requires using an additional process to remove the protective layer disclosed by Yu.

In re claim 7, Applicants assert that "the photoresist layer" and "the acid supplying layer" are two elements, and it is unreasonable to interpret that step of forming the imaging resist layer is equivalent to steps of forming the photoresist layer and the acid supplying layer. Obviously, both Huang and Yu fail to disclose "the acid supplying layer" recited in claim 7. Therefore, Applicants consider that the Prima Facie Case of Obviousness is not fully established and the rejections regarding to claims 1-13 should be withdrawn. Additionally, Applicants want to emphasize that "the acid supplying layer" recited in claim 7 brings unexpected result. In detail,

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since the acid produced in the exposed portions of the acid supplying layer also diffuses to the unexposed portions of the photoresist layer, the dimension of the photoresist pattern can be reduced accompanying with the patterning step of the protective layer.

In re U.S. Patent No. 6,939,664 and U.S. Patent No. 5,282,066, Applicants consider that even though Huang and Yu are combined, they do not disclose all limitations recited in the claims 1, 7 and 11. The differences are shown in Table I.

Claim	The present invention	U.S. Patent No. 6,939,664 & U.S. Patent No. 5,282,066
1	An immersion lithography process, comprising: forming a photoresist layer on a material layer;	The present invention is directed to a method of forming a structure on a substrate, including the steps: (a) providing a substrate;  (b) applying a resist composition to the substrate to form a resist layer on the substrate, wherein the resist composition includes (i) an acid-sensitive imaging polymer, and (ii) a radiation-sensitive acid generator, wherein ... (see column 4, lines 55-67)
	forming a protective layer on the photoresist layer;	<u><i>the protective layer formed on the photoresist layer is taught by Yu.</i></u>
	performing an immersion exposure step to define an exposed portion and an unexposed portion in the photoresist layer;	(c) patternwise exposing the substrate to radiation, whereby acid is generated by the radiation-sensitive acid generator in exposed regions of the resist layer; (see column 5, lines 1-3)

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	performing a baking step to alter polarity of the protective layer on the exposed portion of the photoresist layer by acid produced in the exposed portions of the photoresist layer in the immersion exposure step; and	<b><u>**There is no teaching or suggestion regarding to altering polarity of the protective layer.</u></b>
	performing a development step to remove the exposed portion of the photoresist layer and the protective layer thereon.	(d) removing patternwise soluble portions of the resist layer to form a pattern of spaces in the resist layer; and (see column 5, lines 4-6) <b><u>**There is no teaching or suggestion regarding to removal of the protective layer.</u></b>
7	An immersion lithography process, comprising: forming a photoresist layer on a material layer;	The present invention is directed to a method of forming a structure on a substrate, including the steps: (a) providing a substrate; (b) applying a resist composition to the substrate to form a resist layer on the substrate, wherein the resist composition includes (i) an acid-sensitive imaging polymer, and (ii) a radiation-sensitive acid generator, wherein ... (see column 4, lines 55-67)
	forming an acid supplying layer on the photoresist layer;	<b><u>**There is no teaching or suggestion regarding to the acid supplying layer formed on the photoresist layer.</u></b>
	forming a protective layer on the acid supplying layer;	<b><u>**There is no teaching or suggestion regarding to the protective layer formed on the acid supplying layer.</u></b>
	performing an immersion exposure step to define an exposed portion and an unexposed portion in the photoresist layer, while an acid is produced in the acid supplying layer;	(c) patternwise exposing the substrate to radiation, whereby acid is generated by the radiation-sensitive acid generator in exposed regions of the resist layer; (see column 5, lines 1-3)

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	performing a baking step to make the acid produced in the acid supplying layer diffuse to the protective layer and the unexposed portion of the photoresist layer; and	<b><u>**There is no teaching or suggestion regarding to "the acid supplying layer" which is different from the photoresist layer.</u></b>
	performing a development step to pattern the protective layer, the acid supplying layer and the photoresist layer simultaneously.	(d) removing patternwise soluble portions of the resist layer to form a pattern of spaces in the resist layer; and (see column 5, lines 4-6) <b><u>**There is no teaching or suggestion regarding to removal of the protective layer and the acid supplying layer.</u></b>
11	a photoresist layer on a material layer; and	(a) applying a resist composition to the substrate to form a resist layer on the substrate, wherein the resist composition includes (i) an acid-sensitive imaging polymer, and (ii) a radiation-sensitive acid generator,... (see column 4, lines 58-67)
	a protective layer on the photoresist layer for preventing mutual diffusion between the photoresist layer and an immersion liquid used in an immersion exposure step of the immersion lithography process, <b><u>wherein the protective layer is made of an acid-sensitive and radiation unsensitive material and polarity of the protective layer is capable of being altered by acid</u></b>	<b><u>**There is no teaching or suggestion regarding to the protective layer formed on the photoresist layer</u></b> <b><u>** There is no teaching or suggestion regarding to the acid-sensitive and radiation unsensitive material and polarity of the protective layer is capable of being altered by acid</u></b>

Table I

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For at least the foregoing reasons, Applicants respectfully submit that independent claims 1, 7 and 11 patently define over the prior art references, and should be allowed. For at least the same reasons, dependent claims 2-6, 8-10 and 12-15 patently define over the prior art as well.

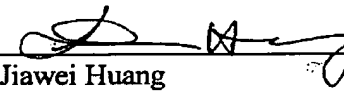
### CONCLUSION

For at least the foregoing reasons, it is believed that the pending claims 1-15 are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

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